*भारतीय मानक*
***Indian Standard***

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# ईंधन–ज्वलित तैलीय भट्टियों के लिए सुरक्षा

# Safety for Oil Fired Furnaces

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Industrial Fuel Fired Furnaces Sectional Committee, MTD 26

## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Industrial Fuel Fired Furnaces Sectional Committee, had been approved by the Metallurgical Engineering Division Council.

Safety is of utmost importance, specially for the oil fired industrial furnaces which are dealing with oil firing equipment.

Main reasons are:

a) Furnaces should be designed and equipped for safe and reliable operation.
b) All process parameters like temperature, pressure, flow of oil, combustion air supply and distribution to burners should be controlled within safe limit to avoid fire hazards.
c) Safety instruments for oil pumping and heating unit are to be provided for safe operation.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be founded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# *Indian Standard*

# SAFETY FOR OIL FIRED FURNACES

## 1 SCOPE

This standard deals with safety norms to be considered while designing and operating industrial furnaces with oil firing system.

## 2 LOW OIL PRESSURE

Low pressure switch will be installed in main oil line and will be interlocked with oil solenoid valve of each zone. In case the oil pressure is lower than the set pressure, there will be audio-visual alarm and pressure switch will give impulse to oil solenoid valve which will cut-off oil supply to the burners to avoid firing problems at the burners and fire hazards in the furnace.

## 3 SAFETY IN OIL PUMPING AND HEATING UNIT

**3.1** Pressure regulating valve with by-pass valve is to be provided in the oil pumping and heating unit. This will regulate the pressure of oil in the main ringmain for proper and safe combustion through the burners.

**3.2** When oil preheater is used for heavy oils like HFO and LSHS, a temperature controller is to be provided with the oil preheater which will be interlocked with the power supply to the oil heater for safe working of heater. In case the temperature of oil exceeds the set limit, there will be an audio-visual alarm and the temperature controller will cut-off power supply to the oil heater.

**3.3** A suitable duplex type filter is to be provided in oil line for reliable operation of pump, pressure regulator, control valves and other instruments in the oil ringmain.

## 4 OIL DAY TANK

Following safety interlocks are to be provided in the oil day tank:

a) Level controller is to be provided with contactor for high level of oil in oil day tank. In case the oil level goes beyond the high set level, level controller will give audio-visual alarm annunciation as well as will cut-off the oil supply to the oil tank by closing supply valve or by switching off the supply pump to avoid over flow of oil.

b) In case the oil level in the tank reduces below set low level, controller will give audio-visual alarm annunciation and will open the supply valve or switch on the pump for filling the day tank.

c) When heavy oils such as HFO and LSHS are used, an outflow heater will be mounted at oil day tank and a temperature controller is to be provided for temperature control. In case the temperature of oil exceeds the set limit, the temperature controller will cut-off power supply to the oil heater.

d) In case of steam oil heater, the temperature controller will cut-off steam, if temperature exceeds set value.

## 5 EXCESS ZONE TEMPERATURE CONTROL

Each zone of the furnace will be provided with a separate excess (override) temperature controlling system. In case the temperature of particular zone is not being properly controlled by the main zone temperature controlling system and exceeds beyond the safe operating temperature limit, this controller will give impulse to the respective solenoid valve to cut-off the oil supply to the burner. The system will include 1 number thermocouple, ON/OFF type temperature indicating controller and solenoid valve. In case the zonal temperature overshoots the maximum set value it will shut off the zone fuel oil solenoid valve and at the same time the system will raise an audio-visual alarm.

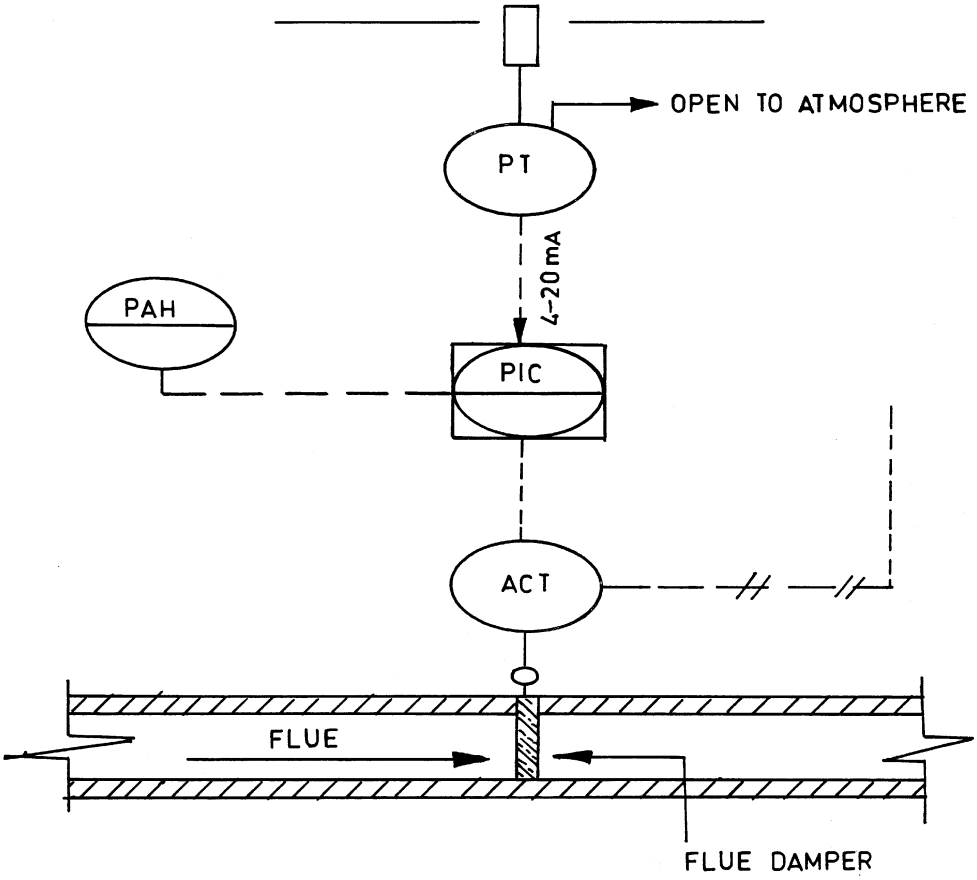
In case of hot redundancy in PLC control the additional excess temperature controller is not required.

## 6 FURNACE PRESSURE CONTROL

In order to control the furnace pressure, one set of furnace pressure controlling instrument is provided which consists of furnace pressure transmitter, pressure indicating controller and actuator motor for flue damper actuation (*see* Fig. 1). In this instrumentation system, the furnace pressure is measured with respect to atmospheric pressure through pressure transmitter which gives signal to furnace pressure indicating controller. Based on the desired set furnace pressure, the pressure indicating controller will give impulse to the actuator for proportionately opening/closing of the flue damper fitted in the flue passage. This process repeats all the times and controls the furnace pressure within the set limit to avoid flame shooting through furnace openings.

## 7 LOW COMBUSTION AIR PRESSURE

A low pressure switch will be installed in the



PT = Pressure transmitter
PAH = High pressure alarm
PIC = Pressure indicating controller
ACT = Actuator

FIG. 1 FURNACE PRESSURE CONTROL LOOP

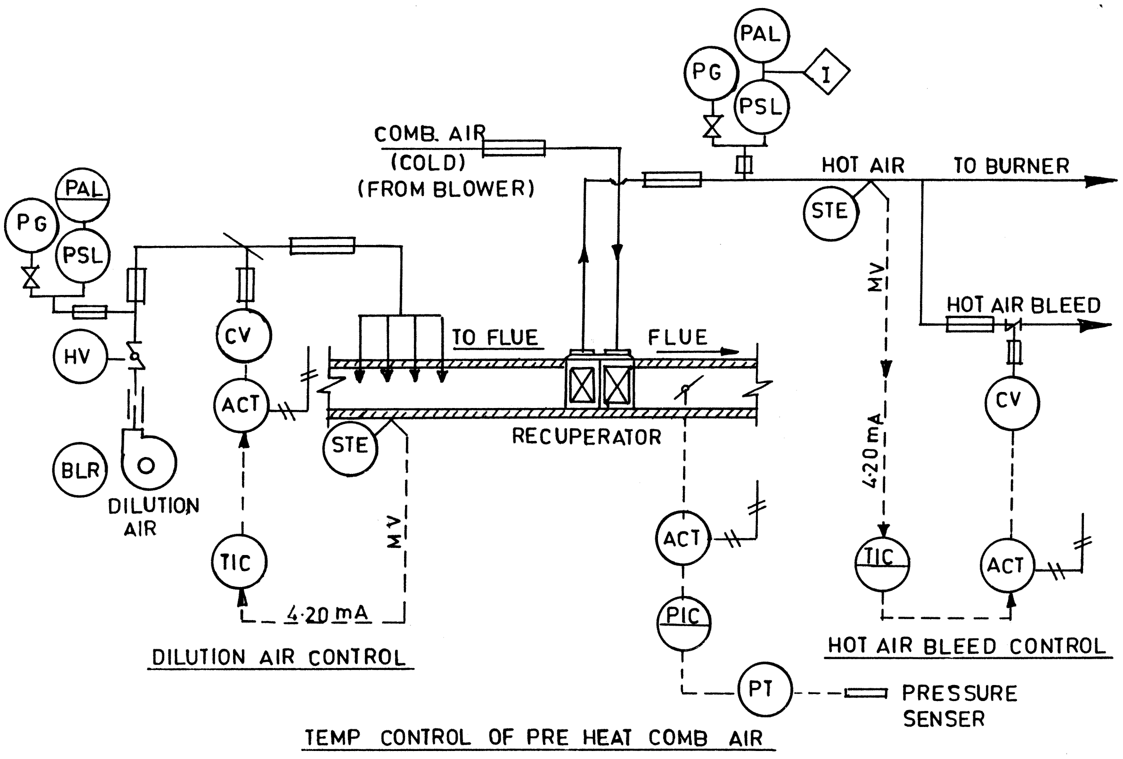
combustion air line after the combustion air blower and will be interlocked with main oil solenoid valve. In case combustion air pressure is lower than the set pressure, there will be audio-visual alarm and pressure switch will give impulse to the oil solenoid valve which will cut-off the oil supply to the burner to avoid flow of unburnt oil in the furnace.

## 8 HIGH COMBUSTION AIR PREHEAT TEMPERATURE AFTER RECUPERATOR

The temperature controlling system comprising a thermocouple and ON/OFF temperature indicating controller will be provided in the combustion air line after recuperator so that if the temperature of combustion air exceeds beyond desired temperature, the controller will provide impulse to the modulating motor/pneumatic actuator of the hot air bleed control valve to bleed off the hot air as safety measure to avoid burner operation system (*see* Fig. 2). This hot air bleed control also protects the recuperator by allowing more cold combustion air flow through the recuperator tubes, thus reducing the mean wall temperature of the tubes.

## 9 SAFETY AGAINST HIGH ENTRY TEMPERATURE OF FLUE GAS TO RECUPERATOR

The temperature of flue gas before entering into the recuperator is controlled and kept within the safe limit. In this system the flue gas temperature is sensed by thermocouple and signal is given to temperature indicating controller. Based on the set desired temperature of the flue gas, temperature indicating controller will give impulse to the actuator of the air control valve in the dilution air line which will open the air flow to the flue passage in order to limit the temperature of the flue gas at the recuperator entry.



TIC = Temperature indicating controller
CV = Control valve
PSL = Low pressure switch
PAL = Low pressure alarm
ACT = Actuator
PIC = Pressure indicating controller

ACT = Actuator
HV = Hand valve
PG = Pressure gauge
PT = Pressure transmitter

FIG. 2 P & I DIAGRAM – TEMPERATURE CONTROL OF PREHEAT COMBUSTION AIR AND DILUTION AIR CONTROL FOR RECUPERATOR ENTRY

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**Amendments Issued Since Publication**

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